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answered if the suggested policy is to be successful. I venture to think that the answer is not difficult: astronomy has been progressing so rapidly of late years that there are many matters, great and small, at which we have only had the time to glance without subjecting them to satisfactory discussion. Important ideas have been laid before the Society and clearly explained, which were so new that the audience was scarcely ready with comments. As one illustration, let me take Mr. Jeans' suggestion that the stellar universe was formerly much more compact, and has since been expanding and scattering. This is an idea which alters profoundly views hitherto adopted and hitherto scarcely questioned. At the time of its suggestion the audience was almost silent, for the simple reason that it was too big a thought to take in at once; but since then time has elapsed and, moreover, Mr. Jeans has published a book. It would be strange if an interesting meeting could not be furnished by the discussion of this new idea.

There are other matters, not on this grand scale, which were passed over quickly, simply because one paper trod on the heels of another, but to which a return could now be made all the more profitably because they have appeared in print.

In further support of this policy I may quote the experience of the Geophysical Society, which has, for a few years past, been holding meetings in the rooms of the Royal Astronomical Society on the lines above indicated. The papers presented have, in general, not been original investigations, but rather accounts of work already published, and the amount of printing has been small.

Doubtless if this policy of an economical year—or, let us call it, without prejudice, a special year—were adopted, other ideas would be forthcoming to furnish the meetings: for instance, we have very rarely had anything of the nature of a conversazione; though the few experiences of this kind have all been most enjoyable. Again, we may remember that there will be a meeting of the Astronomical Union in April next. The April meeting of the R. A. S. might very appropriately be devoted

to a preliminary discussion of the topics which will engage the attention of the Union; or the May meeting might be devoted to hearing from the returned delegates their experiences in Rome. We may hope, further, that this meeting of the Union will bring to Europe welcome guests from overseas, who will doubtless be able to interest the Society, as we have already had ample experience on former occasions.

In November or December we may hope for news from our eclipse expedition. Finally, if the cutting down of the Annual Report should leave a blank in the February (1922) meeting, perhaps the Fellows might like to fill it by a full discussion of the present suggestion, which is put forward very crudely in the hope that it may be fully and freely discussed.—From an Oxford Note-Book in *The Observatory*.

SCIENTIFIC BOOKS

Applied Entomology. An introductory text-book of insects in their relations to man. By H. T. FERNALD. First edition. New York: McGraw-Hill Book Company, 1921.

THE author recognizes a two-fold demand of the agricultural colleges in this country for a text-book of entomology which will give: (1) to those students who desire to specialize in entomology a thorough foundational training in the science; and (2) to those students who intend to engage in practical farming and fruit-growing a general knowledge of the kinds, life histories, habits, and control of insects that are of economic importance. He has succeeded in meeting these requirements to a surprising degree in a book of 386 pages. The author first discusses the position of insects in the animal kingdom, their structure, transformations, the losses caused by them, and the nature and kinds of insecticides in modern use in the control of these persistent pests. Necessarily the discussion of these topics is a brief one being included in less than sixty pages. It seems to us unfortunate that the author did not give in this part of the book a general, though brief, discussion of the nature and importance of the biological control of insects and of the vital and ex-

tensive relations insects bear to many human and plant diseases. The activities of insects as parasites and as carriers of disease organisms are, however, noted here and there throughout the text in appropriate connection with the species concerned.

The remaining pages of the book are devoted to a discussion of the characteristics of the different orders of insects with an account of the life histories, habits, and control of a well-selected list of common, representative, and mostly economic species of each order. The author uses commendable and conservative judgment in recognizing and discussing but twenty-four orders with a brief mention of an additional one, the *Zoraptera*. An economic entomologist often wishes the author had been a little more specific regarding control measures. For example, paradichlorobenzene is briefly mentioned as having "given fair success recently" in the control of the peach-tree borer. This seems hardly an adequate statement in view of the widely successful use of this substance by the Federal Bureau of Entomology and by the New Jersey Experiment Station.

The book is fully illustrated with numerous original photographs and many familiar illustrations. It is certainly preferable to use good familiar figures in a text-book rather than poor original ones but great pains should be taken to reproduce the old figures with distinctness and fidelity. For example, figures 130, 131, 135, and 242 have lost much of their original clearness and detail. Moreover one is apt to be momentarily a bit shocked to find an illustration in a dignified text-book with the legend "Samples of Anoplura greatly enlarged" without any attempt to give the reader an inkling of the species figured. These, however, are small matters.

The book has few typographical errors and closes with an excellent index of twelve pages. Altogether the author has written a well balanced, well arranged text of applied entomology for the beginning student and many teachers will find it very useful with their classes.

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SPECIAL ARTICLES

HIGH SPEED HIGH VACUA MERCURY VAPOR PUMPS

THE writer has on several occasions¹ described two types of high speed mercury vapor pumps capable of producing exceedingly high vacua in reasonably short intervals of time and yet not demanding of the fore pumps pressures less than .01 to .005 mm. of mercury. These mercury vapor pumps were made of pyrex glass and are still in use.

Since then slight modifications have been introduced which considerably reduce the time required in glass blowing though not altering the speed of either pump or the vacua obtainable. The two types in modified form are shown in Figures 1 and 2, and are each drawn approximately one sixth full size. In Figure

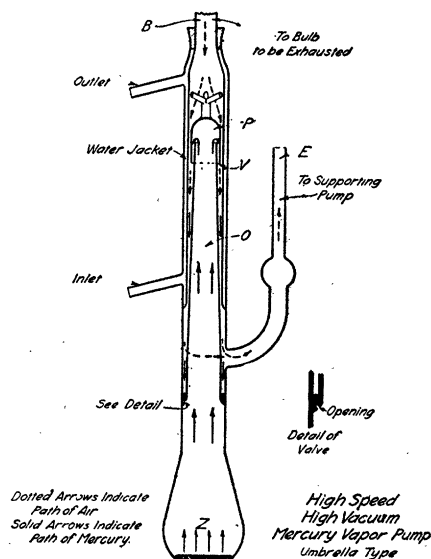


FIGURE 1

1 we have the umbrella type in which the bulb to be exhausted is attached to B, and the supporting pump to E. The hot mercury vapor reaches the umbrella P through the large diameter thin-walled central delivery tube O. The throat at V is large and annular (no central dead space) and hence the issuing mercury vapor comes into immediate contact with the outer water cooled walls. This construction

¹ *Phys. Rev.*, II, 9, 311; 12, 492.